DOCUMENT RESUME

ED 114 268 SE 019 340

AUTHOR Euston, Carol
TITLE A Better Place to Be. A Guide to Environmental Learning in Your Classroom.
INSTITUTION Department of the Interior, Washington, D.C.
PUB DATE [75]
NOTE 43p.
AVAILABLE FROM Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 (Stock No. 2400-00805, $1.25)

EDRS PRICE MF-$0.76 HC-$1.95 Plus Postage
DESCRIPTORS Air Pollution Control; *Ecology; *Elementary Grades; Energy Conservation; *Instructional Materials; Interdisciplinary Approach; Learning Activities; Resource Materials; *Science Education; Water Pollution Control

ABSTRACT

This booklet, designed for elementary teachers, contains ideas for involving students in firsthand experience with their environment and practical suggestions for preservation and improvement of their own homes and neighborhoods. The goals of this booklet are to increase environmental awareness and to help the students become responsible citizens. Among the topics discussed are: Environmental Learning in Your Classroom; Getting Started ; Ecosystems and Classroom Activities; Environmental Problems and Activities; Environmental Learning and the Total Curriculum; School Site Development; Family Participation; Schoolwide Programs; and Awards and Recognition. A listing of environmental organizations, materials and sources, suggested readings and audiovisual aids concludes this booklet. (BT)

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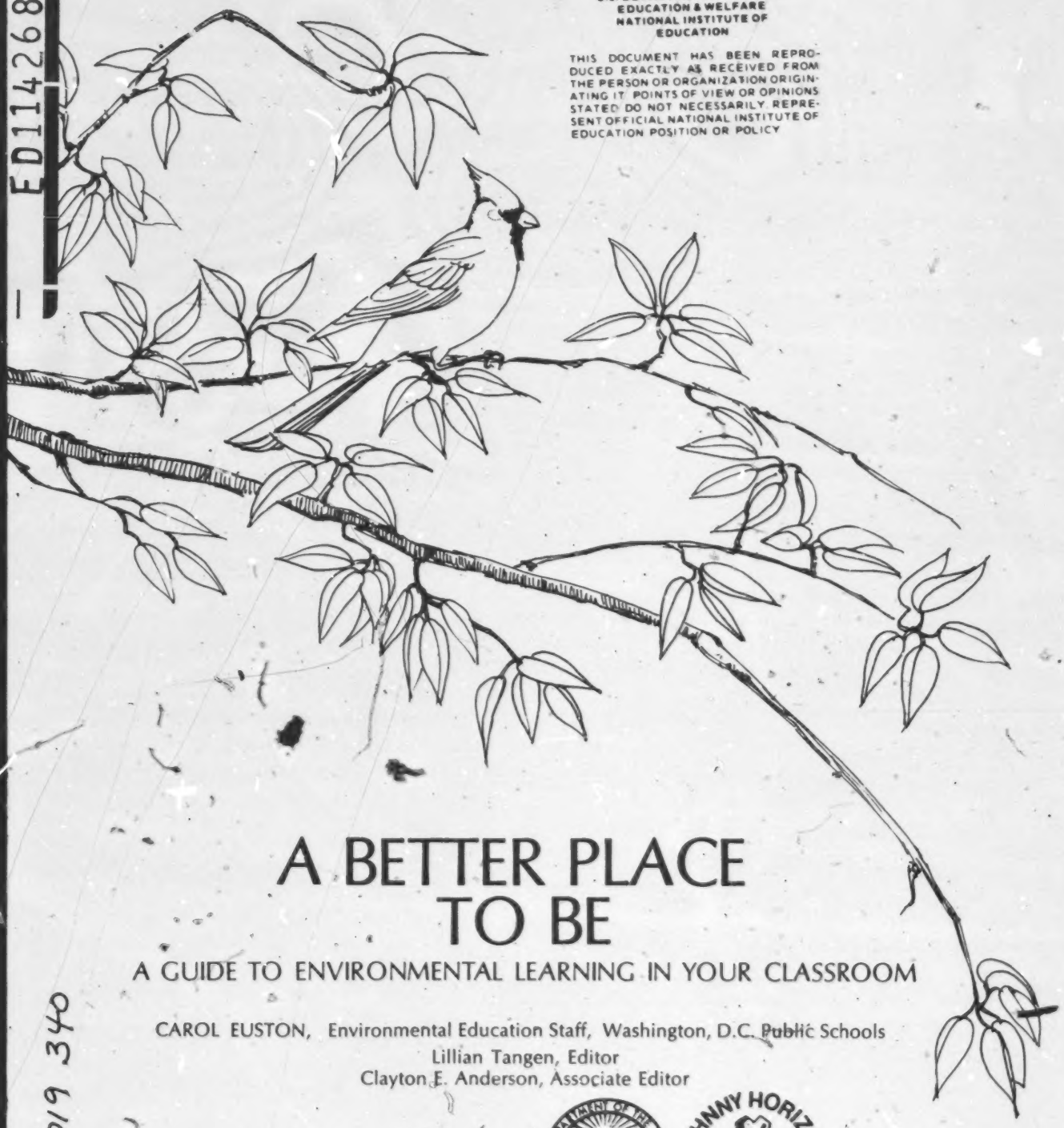

A BETTER PLACE TO BE

A GUIDE TO ENVIRONMENTAL LEARNING IN YOUR CLASSROOM

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SE 019 340

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Washington, D.C. 20240

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1. ENVIRONMENTAL LEARNING IN YOUR CLASSROOM

Environmental education ought to be a total look at where man lives, how he lives and why he lives as he does. By understanding man's use and misuse of the natural community we can better deal with problems that face us.

The suggestions and activities in this booklet do not presume to be a complete environmental education curriculum. They are intended to be a starting point for both the classroom teacher and students.

There is a tendency among teachers to feel that an environmental learning program is a rather complicated and scientific procedure that they are ill prepared to handle. This is just not so. Environmental education can occur by creating climates for learning and is not dependent upon an authoritative understanding of facts and concepts. Ordinary, good teaching methods will allow you to handle experiences and activities in such a way that you will

be able to comfortably discover many interesting things right along with the students. It is possible to set up pleasant, interesting and worthwhile learning situations without being an expert on the subject matter.

Your environmental learning program should emerge from the students themselves. Try to create an atmosphere which will motivate students to explore environmental problems.

A good teacher stimulates curiosity in students while providing tools the students can use to pursue that curiosity throughout life. A teacher brings continuity to the learning process, enabling the students to see the interrelatedness of what they are learning; and that they, too, are part of the interrelatedness.

Environmental learning can be as simple as looking around at your own surroundings to see what they include and what is pleasant and unpleasant about them. The ultimate objective of involvement in an environmental learning program is to enable people to think reasonably and understandingly about their environment—to see patterns of cause and effect which make sense and relate to other aspects of their lives. No one can really be taught environmental awareness; it must be experienced.

This booklet contains ideas for involving students in firsthand experience with their environment and practical suggestions for preservation and improvement of their own homes and neighborhoods. Hopefully, the results will be not only to increase environmental awareness but also to further understanding and appreciation so that students can become responsible citizens and do their share to make this world a better place to be.

2. GETTING STARTED

If possible, a teacher should acquire a little basic background information about environmental education. Find out if your State Office of Education provides environmental education curriculum guides, or write the Department of the Interior for a copy of *All Around you*. This and other environmental study guides are listed under "Suggested Reading." Environmental books written for children can help to give you an overall "feel" for the subject. The science department or science teacher in your building can recommend text books or even help implement your program.

Discuss your plans for an environmental learning program with the school principal. Consider school policy, programs and schedules. Present your educational objectives as well as long-range planning for needed materials, audio-visual equipment, books, trips and projects. Stress that your students are learning about the environment as they learn speech and grammar, science and math, observation and communications skills—the basic elements of education.

CLASSROOM INITIATION

You can introduce your students to environmental learning in many ways. One way might be to show a film such as "A Land Betrayed" as the vehicle for discussion of the environment. To start the discussion you might also use a record of ecologically-oriented songs such as: Burl Ives' "Birds Like To Fly" or "Johnny Horizon," Pete Seeger's "Just A Few Floating Wrappers of Chewing Gum," Woody

Guthrie's "This Land Is Your Land" or The New Seekers' "We've Got To Do It Now." Another way might be to use photographs or slides depicting beautiful scenes of our country and pictures showing blighted or polluted areas and have the students exchange ideas as to cause and effect of some of the situations.

Lead discussions to elicit students' ideas on the meaning of "environment" in order to develop such concepts as:

1. Environment is that which is around you and in one sense is the entire Earth.
2. What we do in a restricted environment can effect the world environment. We are responsible for our actions.
3. All living things are dependent upon their environment for survival and upon a proper balance of plants and animals.

Point out to the students that since we are each responsible for our actions, it is up to us to take an active part in understanding environmental problems and finding solutions to them. Ask them how this can be accomplished. Let them determine areas of investigations and how they can go about finding out more information. Have someone record the suggestions. Help children create an environmental pledge which lists what they will do in their daily lives to help preserve the environment. Keep a large copy of this pledge in a conspicuous spot in the Environmental Center.

STUDENT PLANNING

Let the children form a few initial committees and be responsible for obtaining information. One group can write to various organizations (see Resources) for pamphlets and brochures.

Another group can arrange for class speakers, such as:

- the school custodian to hear his views on the school's environment;
- a sanitation department representative to hear about city waste problems;
- a utility company representative to explain the energy situation in the city;
- a member of the town or city council to explain some of the overall concerns of the city government;
- a member of the park department to teach them about natural ecosystems and food chains of woodland animals;
- a city planner to explain patterns and problems of urban life.

A third group could survey classmates as to trips they might want to take to see some of the problems firsthand. Some suggestions are: The dump or incinerator plant; a nearby river or park; a local museum; a recycling collection center; a waste treatment plant; a factory or industrial area of the city; a nature center, zoo or aquarium, etc.

A fourth group could be in charge of collecting pertinent books and magazines from the library as well as maintaining the newspaper scrapbook for the Environmental Center.

ENVIRONMENTAL CENTER OR LEARNING STATION

This station or center can be the permanent core of all environmental activities for the year. The first display might be the class' proposed plans for its environmental learning projects. There should be a list of questions to be answered and ways to find out this information—i.e., names of committees and their tasks, all the printed information that is gathered and graphic displays of various environments.

Some other things that might be included initially are:

1. Classroom pets, such as gerbils, hamsters, guinea pigs, mice, a bird, snakes, an aquarium.

2. Books, pictures, articles, etc., about the animals near the cages. Put a "find out" activity card near the books that ask such questions as:

What is the natural environment of this gerbil?
What part does the snake play in a food chain?
How are birds helpful to man? and other similar questions that lead children to become aware of the interdependence of life.

3. Encourage children to bring in plants for the Center; have them plant seeds in paper cups to watch the plants grow or let them make cuttings to root from the existing plants. Have "find out" activity cards nearby that will give the children reason to explore the plant world either by research or experimentation.
For example:

How is this plant nourished?
What would happen to this plant if you put a cardboard box over it for a week?
What would happen if you watered this plant four times a day—or not at all?
Would it make a difference in our way of living if all the green plants died tomorrow?

Children would then begin to see the role plants play in the environment and as a part of the food chain.

4. Ask the children to bring in artifacts or interesting objects they might find out-of-doors to share with the class and to include in the Center's collection; if possible, allot a few minutes each day for this purpose. Some suggestions are: bone, feathers, driftwood, an insect, a smooth pebble, a half-eaten leaf, a cup of rainwater, a budding branch, a brick, etc. Whatever the object, determine if it is natural or man-made and how it relates to man. For example: Insects such as ladybugs and beetles eat other insects that destroy vegetation; rainwater is necessary for plant life, for preventing dust, etc.; a brick is made of hardened clay and is used in building construction; the leaf is a food source for insects.

These discussions might motivate children to further investigation or problem-solving of the interdependence of living things.

5. The Center might start various types of collections to which children can contribute: insect, rock, seed, leaf, wildflower or weed. Have books available for identification purposes; let the children do the labeling. Empty egg cartons can hold smaller items. Individual collections should also be encouraged.

6. A scrapbook should be kept to which everyone can contribute newspaper and magazine articles and pictures concerning environmental problems. One group can be assigned to categorize them.

7. A dictionary index file of environmental words and definitions.

8. The Environmental Center should be a viable station. Graphic displays of current projects, as well as future plans of investigations, are important to show the students what they have accomplished and where they are going. These displays can be in the form of dioramas. A shoe box or cardboard carton can be used as a container; background and figures can be cut out of heavy paper and cardboard and mounted inside to give a three-dimensional effect.

SUPPLEMENTAL AIDS

The major instructional emphasis in most schools today is in the area of language arts—especially reading. The following materials, which are paper editions and not expensive, can be used very effectively as supplemental aids to reading as well as sources of information and ideas in environmental learning:

American Education Publications (Education Center, Columbus, Ohio, 43216). *MY WEEKLY READER PRACTICE BOOKS: Ecology* Grades 4-6 (A,B,C level), 50-page paper workbook, 30¢. *Focus on Pollution* Grades 1-6 (A,B,C level), 30¢.

National Wildlife Federation (1412 16th Street, N.W., Washington, D.C., 20036). *Ranger Rick's Nature Magazine*, 10 issues for $6.00.

Silver Burdett Company (250 St. James Street, Morristown, New Jersey 07960). NEED Program, developed by the National Park Service, U.S. Department of the Interior, *Adventure in Environment* Grades 3-6, Teacher's Guide, $1.20. (Price subject to change.)

Look through your school's film library catalogue, and list all appropriate films for your environmental program. Order them in advance, and use them to illustrate those concepts that the children cannot actually experience. Public libraries and environmental organizations also lend these films. Contact them well ahead of the date that you will need the material.

3. ECOSYSTEMS AND CLASSROOM ACTIVITIES

By creating miniature environments students learn the specific natural conditions required to support various forms of plant and animal life and how these elements are renewed to sustain life itself. This relationship is known as an ecosystem; the study of ecosystems is called ecology. Miniature environments introduce students to the basic elements and processes of nature vital to all ecosystems and visually illustrate the interdependence of life. For younger children they can provide initial exposure to and appreciation for the natural world. They can also provide a means for advanced instruction in plant life processes, wildlife behavior and problems of pollution.

TERRARIUMS

Terrariums can be used to provide the basic shell for miniature environments in which animal and plant life live in a healthy, simulated, ecosystem. The containers can be varied—even a simple, clear plastic drinking cup turned upside down can become the container for a miniature terrarium. Aquarium tanks, glass gallon food jars, or clear glass, wide-mouthed bottles; all are suitable and should be able to be sealed.

There are many commercial books available on construction of a wide variety of terrariums, but a simple, basic type that thrives well in the classroom is the woodland variety. Many small plants, including mosses, ferns, lichens, clover, etc., are easily available and are well-suited to this enclosed environment. Many mosses, even those that grow in the cracks of city sidewalks, may be included. The plants can be bought at a garden shop or dug from the fields, yards or woods.

One needs some gravel or sand for drainage, some moss or dead leaves to keep the soil out of the drainage material, some charcoal to sweeten the soil against sourness and, finally, some moist potting soil which should be mixed with perlite to loosen the soil. These are the basic ingredients for all terrariums except cactus. The cactus requires sandy soil, less moisture and more sunlight.

Some condensation on the inner walls of the terrarium is an indication that the environment is adequately humid. If it is too heavy, then remove the cover for a few hours or wipe it dry. Do not overwater; about 6 tablespoons of water is enough to maintain an 8-inch container for a month. A light spraying is all that is needed when all evidence of condensation has disappeared. Since the terrarium is closed, moisture is contained, and the water cycle of nature functions normally. Direct sunlight should be avoided but good light is essential.

- Cactus plants can be purchased and should be grown in sandy soil.
- Chameleons can be added.
- Turtle ponds can be constructed.
- Life in a terrarium can be considered as population and community study and will exemplify producer/consumer cycles. Mealworms, crickets, grasshoppers, frogs, roaches, can be used.

ECOSYSTEMS

Ecosystems are made of living and non-living things. The organisms of an ecosystem depend on their environment for many needs.

- Design on paper or make a model of an ecosystem on your own that is completely self-maintaining. Study the relationship of the producers, consumers, predators, scavengers and decomposers of the system. Some examples of ecosystems might include a park, a spaceship, aquarium, terrarium or vivarium.

DECOMPOSERS IN AN ECOSYSTEM

Decomposers, such as fungi and bacteria, break down the bodies of dead organisms in an ecosystem. Try this experiment to find out at what rate decomposers break down organisms as compared to the rate of organisms without decomposers.

- Get some soggy leaves from the ground or gutter; divide the leaves into two groups—samples A and B.
- Put the samples in separate containers; pour water over them to a depth of about one inch.
- Boil leaves of sample A for a few minutes; don't boil sample B. What happens when the leaves are boiled?
- Put each sample into a separate plastic bag, and seal; punch several holes in bag B. Why do you think air holes are needed?
- Set the two groups aside, and observe decomposition rate. How does the rate at which sample A decays compare with the decay rate of sample B? Why?

DIVERSITY WITHIN AN ECOSYSTEM

In order to begin to develop an understanding of succession, change and diversity in nature children should become aware of the wide variety of living and non-living things that make up any part of a natural environment.

- Have several groups of children obtain hula hoops or large loops made from wire hangers.
- Toss onto the school grounds or on the grassy surface of a park.
- List all the living and non-living things found within a perimeter of the hoop.
- If possible take one sample leaf from each type of grass; put in a plastic bag.
- Draw or name each type of insect.
- How do some of the living things observed manage survival?
- What are some of the characteristics which contribute greatly to the ability of an organism to survive?
- How do the non-living things fit in or affect the lives of the living?

WEB-OF-LIFE

The energy requirements of man are met primarily by "food," and men are dependent upon other organisms through food chains and food webs.

- Using students to represent the components, construct models of two or three simple food chains, and convert them to a food web.
- Prepare 6" X 12" cards lettered with such labels as Sun, Soil, Green Plants, Mouse, Grasshopper, Earthworm, Snail, Frog, Shrew, Robin, Garter Snake, Rabbit, Owl, Fox, Goldfinch, Sparrowhawk, etc. Prepare enough cards to supply about half the class; let the other half serve as an audience.

- You will also need a ball of string which can be cut to convenient lengths and used to connect the links in the food chain and web.
- Assign a card to each pupil. Starting with Sun, connect it to Green Plants by asking the two pupils to hold a length of string between them.
- Next, connect one of the herbivores to the plants; follow this with a carnivore linked to the herbivore. At first the components will depict simple food chains but as more and more components are added, cross-links begin to be evident and the food web concept is easily developed. At the outset, it is

advantageous to place the pupils representing the sun and plants centrally and then allow the remainder of the web to develop around them

Questions to develop:

Why is the sun necessary to all life?

What is the source of food used by animals?

In a natural environment, if all the members of a particular species, such as grasshoppers, were removed from the food web, what would be the effect? This point can be emphasized by removing the appropriate pupil from the model.

In a natural community, what would be the effect of removing all predators (insect-eating birds, foxes, etc.) from the food web?

How would an increase of predators affect the food web?

As part of a food web, how does man differ from all other organisms? (Man attempts consciously to manipulate the components which make up the web, and man alone has the ability to understand the complex interdependencies and, therefore, has the obligation and responsibility to preserve the balance of the whole web.)

FOOD CHAINS IN THE COMMUNITY

Predators are important in helping to keep the communities in an ecosystem in balance.

- Take a walk around your community.
- Make a list of all the predators you see (spiders, birds, cats, etc.).
- Select from your list a predator that was most interesting to you, and find out all you can about it.
- Report to your class about it.
- What would your community be like if the predator you chose suddenly outnumbered all the other animals in your community?
- How do you think your community would be without the predator?

ENVIRONMENT • FOOD • MAN

Whenever we eat, we become part of a web of interrelationships. Since many foods are produced far from our tables, we must depend on farmers, pickers, packers, food processors, transportation and food retailers, but primarily we still depend on the environment.

- Collect and examine various packages of food—can of beef stew, box of cereal, package of hot dogs.
- Read the label and find the list of ingredients.
- In column A, list the things that come from plants; in column B, list the things that come from animals; in column C, list man-made products, chemicals and things you're not sure of. (You may want to research these ingredients.)
- Have the students make lists of all the food they ate during the previous day. The list should be as detailed as possible. Direct the discussion so that man's dependence upon the environment will be demonstrated.

What plants are included in the list?

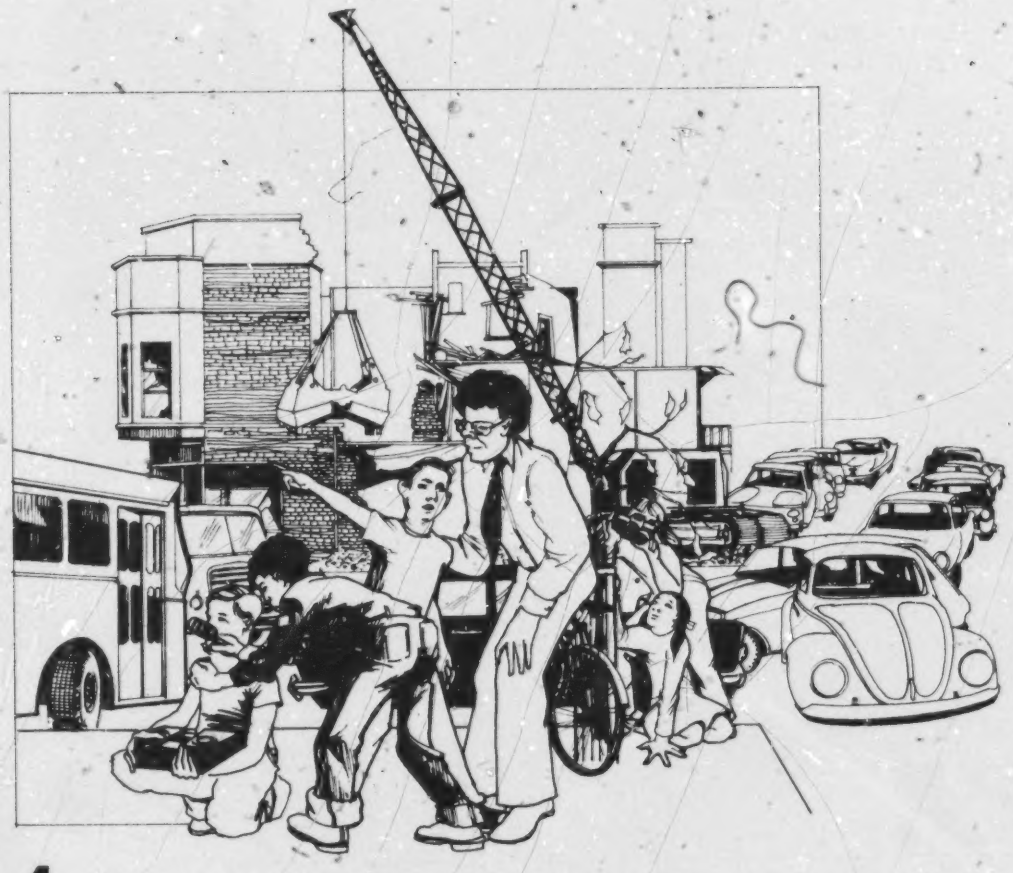
What animals provided the meat food?

What do these plants and animals need to survive?

Are any of your food sources threatened by pollution?

Are the sources of food for plants and animals themselves in any way threatened? If these food sources are in danger, how will this affect man? (The economics of supply and demand could be introduced here.)

What can man do to protect his food supply?



4. ENVIRONMENTAL PROBLEMS AND ACTIVITIES

Educators agree that a student learns best from direct, purposeful experiences. A well-organized field trip into the local community is an ideal way to give children an opportunity to use their five senses in the learning process. At the same time, children gain lasting impressions of the causes, effects and possible controls of pollution. Field trips need not be long or taken great distances from the school. It is a good idea for the teacher to prepare by taking a preliminary trip in order to identify material to point out to students.

A survey walk of the school building and grounds can help you teach students observational skills so that future excursions into the community will be more rewarding. Children can be taught to observe, survey, record, predict, interpret, generalize and conceptualize.

To help children broaden their understanding of environmental concepts, consider trips to zoos, museums, botanical gardens, aquariums or visits to forests, wetlands, lakes, reservoirs. If yours is a suburban community, then visit a city. If you live in a rural area, visit an urban neighborhood. If possible, take a camera and tape recorder with you to document problems for later discussions. Learning about any specific subject will take place only after appropriate and varied experiences.

OBSERVATIONS ON A POLLUTION WALK

Route of Walk _____

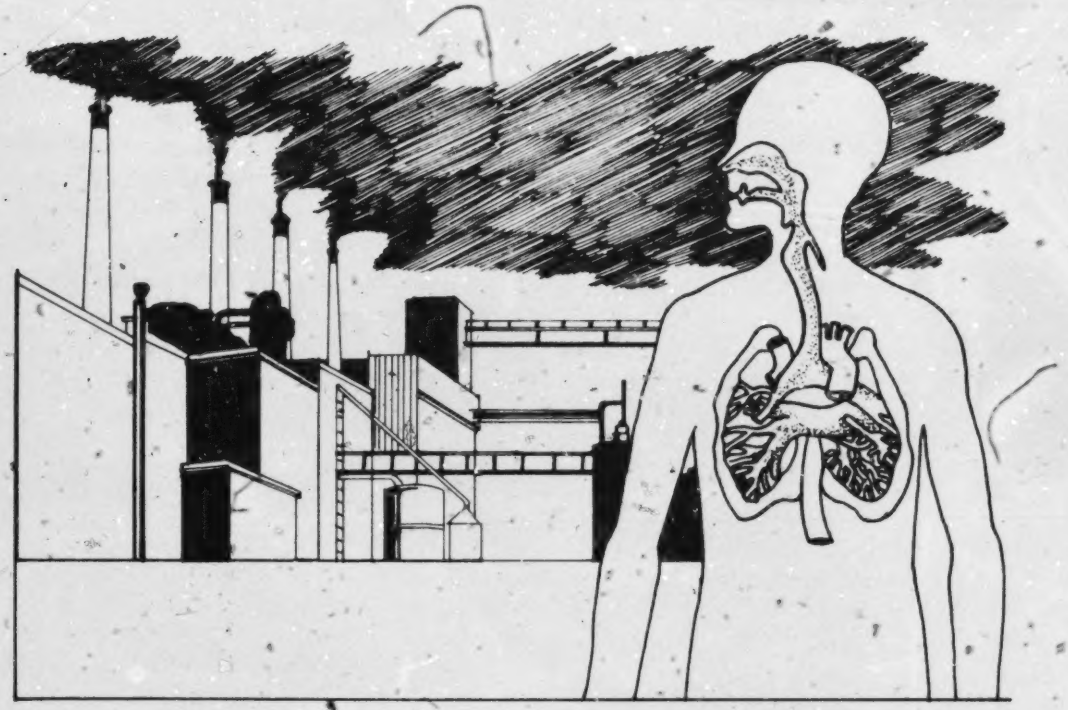
_____

Date _____ Time _____

Weather Conditions _____

Environmental Problems	Observed	Not Observed	Comments
1. smoke from smokestacks, chimneys, burning trash			
2. exhaust fumes from cars, buses, trucks			
3 smog			
4. deteriorating paint on buildings and and cars			
5. stained and soot-covered buildings			
6. dying plants and trees near street			
7. people coughing			
8. people using insecticides			
9. eroded banks, hills, lawns			
10. leaking pipes, fountains			
11. dirty streams, rivers			
12. trash in streets, alleys			
13. abandoned cars			
14. open dumps			
15. rats, roaches, dead animals			
16. unpleasant odors			
17. oil spills			
18. junkyards			
19. heavy traffic			
20. crowds			
21. noisy autos, trucks, buses			
22. noisy airplanes			
23. noisy construction equipment			
24. ugly billboards and signs			
25. rundown buildings			
26. broken windows			
27. writing on walls			
28. crowds of people			
29. other			

The following activities are recommended as starting points to study specific pollution problems. They do not require many materials or equipment; nor do they go into any great technical analysis. They are directed, primarily, to the skills of observation, prediction and communication. (Record the purpose, procedures and conclusions of all activities in the Environmental Center.)



AIR POLLUTION

The average person breathes 35 lbs of air each day—(that's 6 times as much as the food and drink he consumes).[1] Yet in the U.S. we pollute our air with over 200,000,000 tons of "aerial garbage" each year from industrial smoke wastes, auto emissions, incinerators, etc.[2] This dirty air costs us over $12 billion a year,[3] but it is more than a costly nuisance. Dirty air shortens our lives by contributing to lung diseases; it ruins vegetation, causes paint to peel and discolor, corrodes metals, and wastes fuel.[4] Air pollution can be minimized if people know the problem and work to control it.

Air pollutants are:

- Solids, such as dust, soil, soot;
- Gases, such as sulphur dioxide and carbon monoxide;
- Aerosols, such as pesticides and chemicals.

[1] *Needed: Clean Air*, Channing L. Bete Co., Inc., Greenfield, Mass., 1976, pg. 3. (Distributed by the Environmental Protection Agency, Washington, D.C.).

[2] *Ibid.*, pp. 4–5.

[3] *Ibid.*, pp. 6–7.

[4] *Ibid.*, pp. 6–7.

ACTIVITY 1:
Identifying Air Pollutants

- Cut a piece of waxed paper into 2½" squares; staple to heavy cardboard.
- Coat the waxed paper with a thin layer of vaseline.
- Place the papers in various locations where they can remain undisturbed for a week. The classroom, cafeteria, playground, the children's backyards, a local store or the bumper of a car might be appropriate locations.
- At the end of the week collect all the papers carefully and examine them with a magnifying glass to see which received the most pollution.
- Try to identify dust, pollen, ash, spores, soil and other particles.
- Which was the most common type found?
- Which location attracted the most particles? Why?
- Organize all data into a chart showing date placed, date collected, location, amount of accumulation, possible cause of pollution and reason for variance.
- Display chart in Environmental Center.

ACTIVITY 2:
Determining Air Pollution

- Obtain a clean, white plate or saucer; wash again carefully.
- Wipe it with a clean, white rag; save the rag in a plastic bag. Label.
- Put the plate outside on the windowsill of the classroom for two weeks or longer; then bring in.
- Wipe the plate with another clean, white rag the same size as the first one you saved; compare the two rags.
- Record date and possible causes of this air pollution. Keep the report of the activity at the Environmental Center.

ACTIVITY 3:
Collecting Pollution

- Bring in a canister vacuum cleaner tank.
- Get two filter papers. Cut one a little larger than the size of the intake opening, and hold it in place with a rubber-band; save the other as a control.
- Let the vacuum run in the classroom for 30 minutes (perhaps during lunch hour).
- Take off the filter and examine it. Compare it to unused one; try to determine causes of air pollution in classroom.
- If possible, repeat outdoors or in children's homes; vary the activity by collecting at different times of day in the same place.
- Record all data and conclusions at the Environmental Center.

ACTIVITY 4:
Auto Emissions

NOTE FOR SAFETY:
This must be a carefully supervised activity carried out only with an adult present. Keep face and body as far away from car as possible.

- Tape a 4" square of white facial tissue to a piece of cardboard.
- The teacher should start car in parking lot; let run for a few minutes.
- Hold the collector paper parallel to and about 6 inches away from the mouth of the exhaust pipe of the car for one minute.
- Label the collector paper with the year and make of the car and, if possible, type of gasoline used.
- Write and ditto the instructions for this experiment for the parents. Ask for their cooperation and supervision to use the family car for this activity.
- Gather all collector papers; be sure they are labeled as directed; group them in rows from cleanest to darkest.
- Is there a relationship between the amount of pollution and the year of the car? Between pollution and type of gasoline? Between pollution and kind of car?
- Record all data and conclusions for the Center.

WATER POLLUTION

Water is essential to all life on Earth. It comes from rain and snow. While the amount of rain and snow is about the same each year, our population is growing, and per person use of water is increasing.[5] In the U.S. per person use of water is four times what it was in 1900.[6] Industrial use of water is 13 times what it was in 1900,[7] and irrigation use up seven times since 1900.[8]

To maintain an adequate water supply we need to reuse it and minimize its pollution.

ACTIVITY 1:
Filtering Water Samples

- Collect samples of water from the tap, rainwater, reservoir, a pond, muddy water.
- Gather a funnel, paper towels or filters and glass jars for each sample. The glass jars should be tall enough that the mouth of the jar will hold the funnel cone and prevent the spout from touching the bottom.
- Fold and cut the paper towels to form a cone which will fit the funnel.
- Pour each water sample through a filter into a jar. Be sure to use a new filter and a clean glass jar for each sample.
- Replace the liquid into original containers. Unfold each piece of filter paper and dry.
- Examine the dried filter papers with a hand lens. From which samples did the filter remove color? What about turbidity? What types of particles removed by the filter? Will a filter remove chemicals? (Try salt in water.)
- Describe observations, conclusions, record all data.

ACTIVITY 2:
Which Detergent Produces The Most Foam?

- Obtain small amounts of many different brands of detergent; request that the children ask friends and neighbors.
- Collect a number of baby food jars and lids that are identical in size. You'll need one jar for each detergent.
- Add tap water to each jar until it is approximately half-filled.
- In other containers (one for each detergent) make up soap solutions by mixing 1 tsp. of powdered detergent with 3 tsp of water. Be sure same amounts are added to each container.

[5] *Needed: Clean Water*, Channing L. Bete Co., Inc., Greenfield, Mass., 1971, p. 4. (Distributed by the Environmental Protection Agency, Washington, D.C.).

[6] *Ibid.*, p. 6. [7] *Ibid.*, p. 6. [8] *Ibid.*, p. 6.

- Use a medicine dropper to place 10 drops of one kind of soap solution into one of the jars of water; cap; then shake the jar 10 times.
- Measure the height of the soap suds which form on top of the water.
- Record the measurements.
- Record the number of minutes it takes for the suds in each jar to disappear.
- Carry out steps 5, 6, and 7 for each brand of detergent.
- On a graph record the height of the soap suds and the time which they last; compare. Which brand of detergent produced the most suds? Lasted the longest? How does phosphate level affect suds?

ACTIVITY 3:
How Pure Is Drinking Water?

- Put about ½ cup of regular tap water into a clean, aluminum foil pan.
- Evaporate all of the water by heating the pan over a hot plate.
- Note the white mineral or scum that appears. Is the water pure?
- Repeat the same activity using distilled water. Discuss the differences.
- Display the pans showing the minerals present in drinking water compared to those present in the more purely distilled water.

ACTIVITY 4:
Trip To A Polluted Body of Water

- If there is a stream or river within walking distance of the school, take a trip there to study pollution.
- Observe the water for evidence of:

Natural Pollution
- silt
- driftwood
- decomposed plant or animal matter
- dissolved minerals

Man-Made Pollutants
- sewage
- trash
- dead animals
- oil slicks, dyes
- odors

- Record your observations.

ACTIVITY 5:
Water Conservation

- Start a campaign in school and at home to conserve water. Don't let the water run while you're brushing your teeth. Watch for dripping faucets at home and at school. When washing your hands, turn the water off while you rub your hands; then turn it back on again to rinse.

SOLID WASTES

In 1972 urban refuse generated in the U.S. totaled 300 million tons[9]—the equivalent of more than 8 pounds daily for every man, woman and child.[10]

What to do with this refuse presents a difficult environmental problem. Uncontrolled open dumping is unsightly and unsafe. Dumping into the sea is no longer tolerable. Sanitary landfill space is becoming more difficult to find, and use of inadequate incineration facilities causes air pollution.

Solutions lie in good solid waste management, reducing consumption of materials and recycling and reusing what otherwise would be waste.

[9] *Fact Sheet on Edmonston, (Md.) Solid Waste Recycling Project*, Bureau of Mines, U.S. Department of the Interior, Washington, D.C.

[10] *Ibid.*

ACTIVITY 1:
Degradability of Paper

- Collect several different kinds of paper. For example: facial tissue, note paper, newspaper, a page of a slick magazine and a paper towel.
- Cut a sample from each to use for identification.
- Trim so each piece is the same size.
- Collect several jars that are the same size and have lids.
- Place equal amounts of water in each jar.
- Place a different kind of paper in each jar.
- Tape samples on the outside of the appropriate jars.
- Label the lids.
- Replace the lids, and shake each jar 20 times. Compare the paper inside with the sample taped outside.
- Leave the jars undisturbed for one week. Then shake each again 20 times.
- Compare. Which kind of paper changed the most? The least? How did they change? Discuss why degradability is relevant to solid waste treatment and disposal.

ACTIVITY 2:
How Much "Trash"
Do You Accumulate?

- Obtain five heavy, refuse bags.
- Each day for five days collect all classroom refuse in one bag. Use a different bag each day.
- Record the weight on a chart.
- After five days determine how many pounds of refuse were accumulated in the classroom during one school week. If every classroom collects approximately the same amount of refuse as does yours, how many pounds are accumulated in one week? In one year?
- Ask a representative of the school maintenance staff to speak to the class.

Discuss:

How much refuse does the entire school accumulate in one day or week?

How is school refuse disposed of?

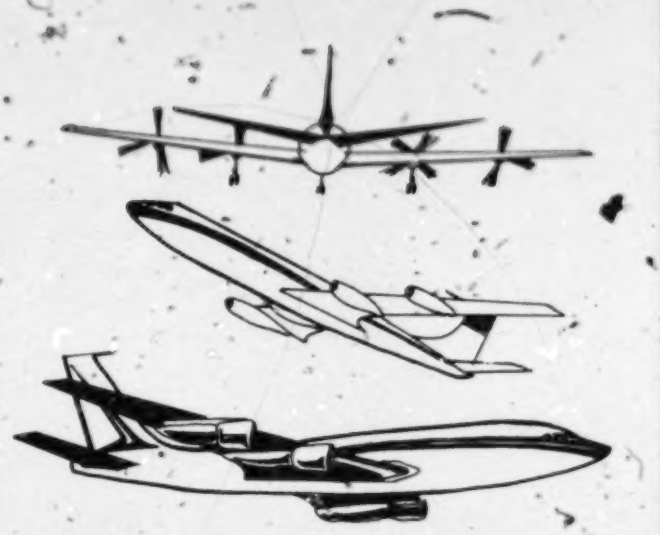
Does the disposal system contribute to pollution?

Are there any ways you can reduce the amount of refuse in the classroom? For example, can you reuse any materials? Can you take some kinds of refuse materials to a recycling collection center or scrap dealer?

Would eliminating throwaway beverage containers help reduce the solid waste disposal problem? Discuss and compare buying and disposing of twenty cans or bottles, versus reusing the same container twenty times.

ACTIVITY 3:
Solid Waste Management

To learn about community waste treatment and disposal arrange with representatives of the city or county government to take the class on a guided tour of a sanitary landfill site or incineration or waste treatment plant. Discuss the advantages and disadvantages of the operation you visit with your guide.



NOISE POLLUTION

Noise can be defined as unwanted sound. Noise pollution occurs when poeple are subjected to excessive degrees of unpleasant sounds.

These sounds may be unpleasant because of their loudness or volume (measured in decibels), shrillness, suddenness or duration.

The world around us is getting noisier. We are exposed to noise from planes, traffic, machinery, construction and sometimes "rock" music. At home, television, air conditioners, blenders, vacuum cleaners, washing machines, power lawnmowers and many other household items can contribute to noise pollution.

Noise pollution interferes with conservation, sleep, recreation and the general quality of life[11] and can cause hearing impairment. Permanent hearing loss can be caused by steady exposure to about 90 decibels,[12] a level which can be generated by a single trailer truck at expressway speed.[13]

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[11] *The Third Annual Report of the Council on Environmental Quality*, Washington, D.C., U.S. Government Printing Office, 1972, p. 132.

[12] *The First Annual Report on the Council on Environmental Quality*, Washington, D.C., U.S. Government Printing Office, 1970, p. 124.

[13] *Ibid.*

ACTIVITY 1:
Noise and Its Effects on Hearing

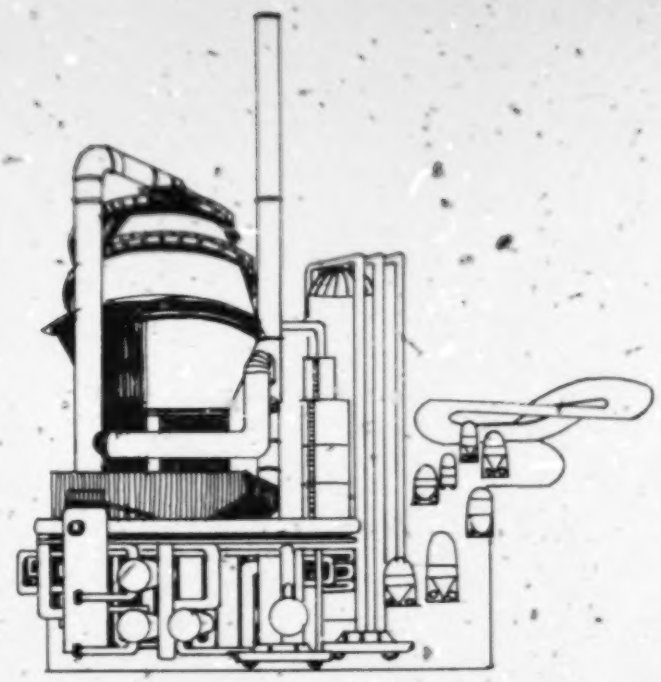
- Obtain a watch and a radio.
- Listen to the watch tick.
- Turn the radio on, and increase the volume until it is loud. Do not let it become so loud that the sound is uncomfortable to you.
- Place your ear near the speaker, and listen for 5 minutes.
- Turn the radio off, and hold the watch up to your ear. Try to hear it ticking. Can you hear the ticking as easily as you could before you listened to the radio?

ACTIVITY 2:
Kinds of Noises

- Sounds have certain properties that can be measured—for example, loudness, pitch and regularity. The higher the decibel rate, the higher the pitch or the more irregular the sound pattern, the more annoying the sound.
- Tape record a variety of sounds from different sources on a recorder. Play them for the students.
- Ask the children to try to identify the sounds.
- Discuss which ones you consider noise. Why?
- List sounds that you consider pleasant and those you find annoying.

ACTIVITY 3:
Reducing Sound

- Attach a buzzer or bell to a 6-volt battery with wires so that it will produce a steady sound. Place on a table.
- Listen to it ring for 2 minutes.
- Place a layer of sponge between the bell and table. Listen to the loudness of sound now, and compare it with the loudness of the sound when the sponge was not used. Was the sound reduced? Why?
- Ask a gas station mechanic how a muffler works on a car.
- Ask the custodian if acoustical tiles are used in the school and why.



ENERGY CONSERVATION

Of all the environmental problems we face, the energy crisis may be the greatest. This problem will affect each of us and how we live, work, travel and play for many years to come.

In simple terms, the problem is an insufficient supply of energy sources we use to run America's homes, factories, schools, offices and the more than 112 million motor vehicles on the road.

One reason for the energy gap is the tremendous increase in our energy demands. We Americans comprise only 6% of the world's population, but we consume 33% of the world's total energy production.[14] Today we use 36% more energy than we did 10 years ago; by 1985 our country's annual requirements for energy will nearly double what they were in 1971; by the year 2000 they are expected to almost triple.[15]

Meeting the energy challenge requires research of production methods which are consistent with our concerns for the environment and conservation practices by all of us.

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[14] *Energy, America and You*, U.S. Department of the Interior, Washington, D.C., 1972, p. 2.

[15] *Ibid.*, pp. 1–2.

ACTIVITY 1:
Using Solar Energy

- Smooth a sheet of foil inside a large deep bowl.
- Fill ¼ of a test tube with water.
- Use a thermometer to determine the water temperature. Record the temperature.
- Tie a string around the neck of the test tube. Leave a long end of string.
- Record the temperature of the air in the sun.
- Place the bowl in direct sunlight.
- Find the focus of the sun's rays on the bowl by holding a white card in front of the bowl. The focus will be where you see a small circle of reflected light on the card.
- Hold the thermometer in the focal spot for a few seconds, and note the temperature change.
- Suspend the test tube in the focal spot.
- Test the temperature of the water at 3-minute intervals. How long does it take for a significant temperature change?
- Repeat the experiment on a hazy day. Compare the results.
- Record results in chart form.

ACTIVITY 2:
Conservationists vs. Electric Company

- Set up this problem for the class: An electric company wants to build a facility on the only available land in a particular area. The land provides a refuge for many kinds of wildlife. The company must state its case before the town council which has the authority to grant or deny the company's petition. Local conservationists oppose the project and will present their reasons for opposition.
- Group the children into three categories: electric company officials, conservationists and town council representatives.
- Instruct the "company officials" to write the local electric company to find out how it selects sites for plants and what benefits it offers the community.
- Instruct the "conservationists" to write local conservation societies to find out how they lobby for the preservation of our natural environment.
- Have both groups prepare their arguments to present before the town council.
- Consider:
  - As the community grows, the supply of electrical energy must keep pace.
  - The plant could provide additional jobs which would benefit the community.
  - A wildlife and nature area will be destroyed.
  - The community will lose a camping, fishing and picnicking area.
- Have the council vote upon the issue and present its decision to both groups.
- Discuss your responsibilities as citizens and consumers to become involved in community affairs such as this one.

ACTIVITY 3:
Energy Conservation

- Have the children make a list of ways they and their families can conserve energy.
- Ask them to find out from the school custodian how they can help save energy at school.

LITTER

Litter is an environmental problem that contributes to air, water, and land pollution and adds to the burdensome costs of solid waste collection.

The cost to collect the litter which thoughtless citizens discard is our nation's parks, roads, streets and other public places averages $88 per ton—more than four times the cost for collection of residential refuse.[16]

Litter is an environmental problem to which children can relate easily. It's also one they can help solve through activities that offer visible results.

ACTIVITY 1:
Litter Patrol

For an action-oriented project:

- Organize the students into a Litter Patrol that on designated days picks up litter on the school grounds. *Carefully supervise collection of broken glass.*
- Obtain sturdy bags for litter collection; have the youngsters wear protective gloves, and use a broom and dust pan to pick up broken glass.
- Design special armbands or badges for the patrollers.
- Keep a photo record of the participants and their accomplishments.
- Consider maintaining a point system for the amount of litter each youngster collects and at the end of each month present a certificate to the student with the most points.
- As a follow-up on litter collection, have your patrollers take on related activities, such as:
  1. Designing anti-litter posters to display in class or school halls. (Ask local merchants to display some of them.)
  2. Staging an anti-litter skit for the school. Show how "villainous litterbugs," "Tommy Trash" or "Lulu the Litterbug," can be foiled by concerted, positive efforts of responsible students.
  3. Writing compositions, poems or slogans on why schools have litter problems and how to convince litterbugs to change their ways.
  4. Designing a litter collage with slogans for the bulletin board.
  5. Surveying the school grounds to determine where the most litter collects. Use a compass for exact location. Make a school grounds "litter map" with a key that explains the kinds of litter. Discuss what factors affect the location of litter—for example: wind, traffic, recess.

16 *The First Annual Report of the Council on Environmental Quality*, op. cit., p. 109.

6. Making certificates of appreciation as special awards for individuals, groups or companies that are helping to improve and protect our environment. Recipients might be: A guest speaker, student, school custodian, newspaper publisher or parent.
7. Constructing litter receptacles for the school.

ACTIVITY 2:
Litter Survey

If necessary, obtain parents' permission for this activity.

- Identify several nearby locations where litter is usually found. The school grounds, a street corner, bus stop, cafeteria or variety store might be suitable places.
- Prepare a survey check list so students can record observations. They might record details such as the time of day, date, and location of their survey, the age and sex of the litterbugs they observe and the kind of litter discarded.
- At noon or some other time of day when you think there will be passers-by at the locations, station students in groups of two at the sites. Have them watch for litterbugs and record their observations.
- Repeat the survey on several days so the data will be reliable.

ACTIVITY 3:
Community Cleanup

- Organize a one-day community cleanup. Ask parents to help supervise the project and haul collected litter to disposal sites. Ask local merchants to display cleanup posters in their stores and donate bags, containers and protective gloves. Solicit the participation of others in the community. Contact local media to cover the event.

ACTIVITY 4:
Recycling Collection

- Locate a source which will accept recyclable materials. If your community does not have a recycling collection center, find out if any trash collection firms or hauling dealers accept materials to resell to commercial processing plants. Determine what kind of materials (newspaper, bottles, cans) are accepted, inquire about handling requirements and arrange for transportation of materials.
- Obtain containers for the materials to be collected. You might use barrels, cartons or laundry bags. Prepare labels for the containers.
- Obtain a supply of sturdy twine if you'll be collecting newspapers which need to be bundled. If you'll collect metals, obtain a magnet to identify them.
- For one week have the children collect recyclable materials they find on the way to school and during recess. Do not allow them to collect broken glass or other dangerous objects.
- After the materials have been collected and transported to the drop-off point, hold a class discussion on the importance of collecting litter for recycling.

ACTIVITY 5:
Litter Laws

- Have the class research litter laws of your community. Are there fines for littering? Are the laws enforced? When were the laws made?
- Find out how people feel about no-deposit, no-return cans and bottles. How many would return beverage containers to the store to collect a deposit refund.

5. ENVIRONMENTAL LEARNING AND THE TOTAL CURRICULUM

The process of developing environmental awareness, understanding and values can be incorporated into all existing school curricula. The fact that environmental concepts have relevance to the teaching of math, art, science, social studies, and communications in itself reinforces the idea of the "total world." A student will begin to understand this interrelatedness when he, for example, finds he has learned something about ecology while collecting materials for an art project. Similarly, the teacher is likely to discover that any given subject, when taught in this manner, inevitably leads to consideration of other subjects.

SOCIAL STUDIES

Modern industrial, agricultural and social developments have worked many changes in our environment. What was the world like hundreds of thousands of years ago? How has man's technological advance, or lack of it, affected the quality of life in various countries? The ingenuity of man's technology is evidenced by the fact that similar environmental problems are attacked in a variety of ways depending on the sociological variables of a particular area.

- The decimation of the bison by early U.S. frontiersmen produced positive and negative effects on the physical environment, animal habitats and Indian life styles. How can this have happened?
- The American Indians were great conservationists. Why is this true?
- Many ecologists predict famine in India, Pakistan, China and Egypt by the 1980's due to burgeoning populations. Cultural as well as economic factors are responsible for this crisis. Can this prediction be reversed?

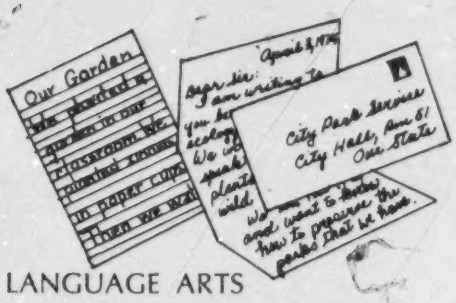
MATH

A lesson which teaches the student to recognize things, their number and size, can generate new and realistic approaches to the environment. For example, a lesson which asks the student to count the different kinds of plant life he sees and to arrange them into sets of similarities not only heightens the student's awareness of plant life but also clarifies for him a basic and highly useful math skill.

Statistics are actually numbers arranged in patterns. Lessons in number arrangements can help the student detect these patterns in his own world. Such lessons show him how to group objects into certain number relationships that reveal what objects should or should not be present in his surroundings and in what quantities.

Eventually, objects perceived in number language will help the student relate what he considers the total environment to all the interactions of his surroundings.

- The concept of measurement can be visualized when spacing plants, buying grass seed to cover an area, planning a fence to enclose a flower bed, reading thermometers, measuring the circumference of a tree, building birdhouses, weighing litter or mapping the school grounds.
- Skill in the construction and use of charts and graphs can be acquired while studying temperature variations, population changes, seed distribution, air inversion indices, consumption of fuel, etc.



LANGUAGE ARTS

The relevance of environmental learning to the student's everyday life is motivation for further inquiry, especially by reading.

- Use encyclopedias or other reference books to find out information about plants, animals and human environments other than your own.
- Design spelling lessons to complement environmental studies.
- Write newspaper articles about environmental projects and activities.
- Keep records, diaries and logs of personal environmental experiences and projects.
- Give reviews and reports of environmental books.
- Write letters to government officials and organizations and to private companies seeking information or inviting speakers.
- Hold essay contests on environmental problems and possible solutions.
- Write original skits or plays—such as "The Invasion of the Green Polluters" —"Litterbug Convention." Costumes can be fashioned from cardboard boxes, mailing tubes and other discarded materials.
- Create games, puzzles, or phonics drills with the environment and its inhabitants as subjects.
- Expand vocabulary skills by listing words descriptive of trees, animals, flowers, a blade of grass, a water-rounded pebble, a spider web.
- Newspapers in general, and editorials and cartoons in particular, are excellent teaching resources for environmental learning. They provide immediacy and thinking. After learning to interpret editorial cartoons, students can create their own expressing ideas about the environment. Some of this work could be prepared as transparencies for overhead projection for class discussions.

ART

Children can be helped to see the environment in new ways through the focus of different art forms. Asked to interpret what he sees in a creative way and according to his choice of medium, the student will come up with his own unique insights and feelings. He can also observe the great variety of ways his classmates interpret the same environment.

Leaf Prints

- Leaves can be used to make many kinds of prints. Pin leaves to paper cardboard and spray paint them; or
- Put leaf, vein side up, on a piece of cardboard. Place a thin piece of paper over the leaf, and rub with a crayon; or
- Use ozalid paper for prints. This paper can be bought in any art supply store; it does not fade as quickly as blueprint paper. The leaf is put on the paper usually on a hard surface such as a book; expose the paper to sunlight for about 15 seconds. Remove leaf, and put the print in a large gallon container. Inside the large jar put a small jar filled with household ammonia—leave this jar open; the fumes of the ammonia will set the print. Cover for several minutes.

Tie-Dyeing

Natural dyes can be made from many things found in woodland areas—pokeberries, walnut hulls, dandelions, etc. Use big white handkerchiefs and try tie-dyeing.

Spore Prints

Spore prints can be made from mushrooms. Cut off the cap of the mushroom. Put the cap down on a piece of white paper and cover the cap with a glass. Leave at least 24 hours. The spores will drop down to the paper and leave a print of many tiny spores. Prints can be preserved by spraying with plastic spray.

Wooden Pins

Pins or pendants can be made from "slices" of wood. The slices can be cut from a limb about 2 or 3 inches in diameter. Sand the surface to show the wood grain. A pin can be glued to the back, or small holes drilled on each side and threaded with cord to hang around the neck. The student's name can be printed on the pin for Ecology Club meetings, or as Litter Patrol badges. The same slice can be used to make I CARE buttons. After sanding, glue a small nature picture or stamp on the wood. Above the picture write I CARE with a magic marker; these words stand for I Care About Resources Everyday. Finish with plastic spray or varnish.

Rubbings

Use a newsprint quality paper and crayon to make rubbings of natural objects—tree barks, sidewalk textures, pebbles, twigs, etc.

Collages

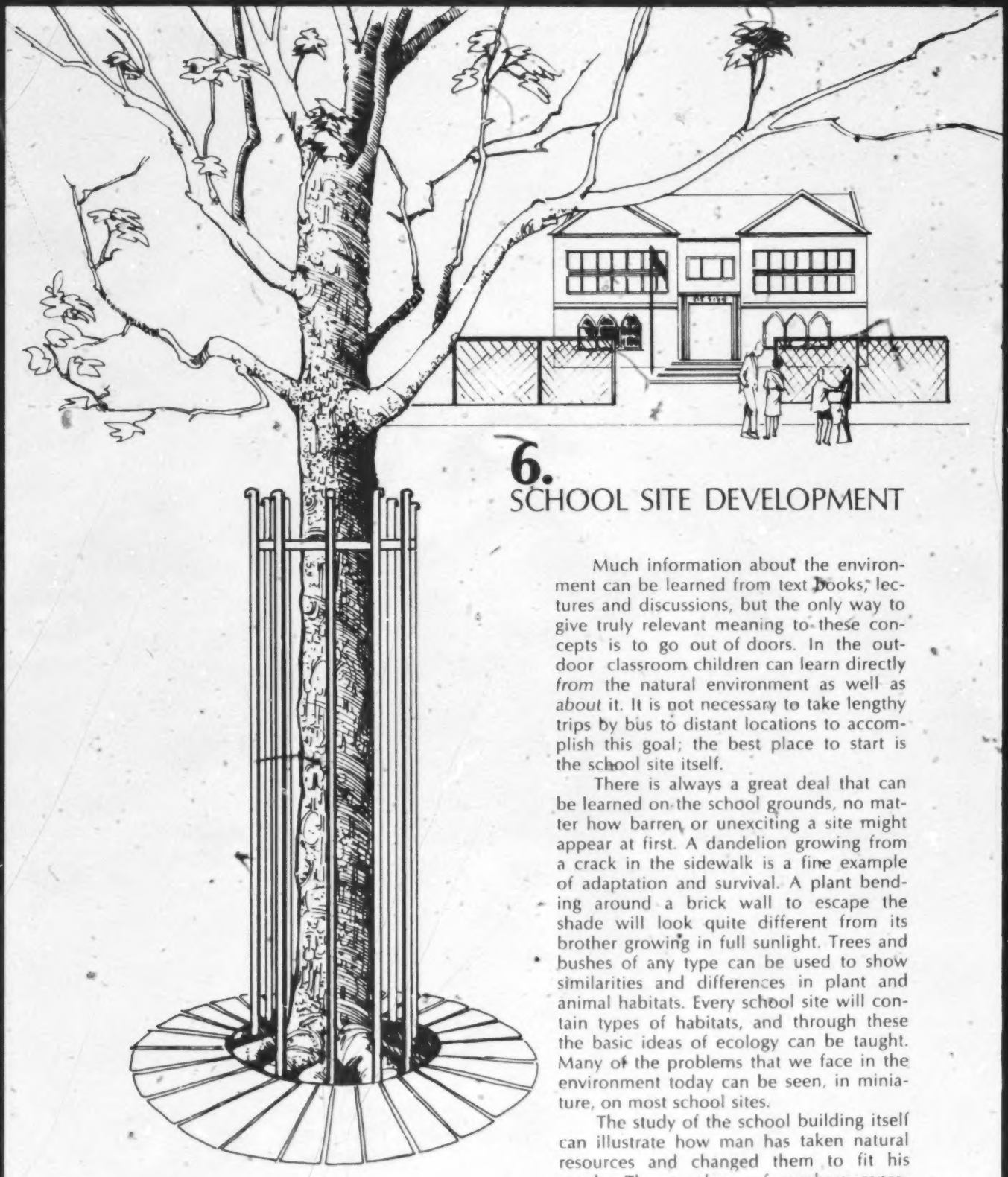
Collect many natural items such as twigs, roots, pebbles, grains, grasses, berries, acorns, driftwood, soil, etc. Position these items into a pleasing arrangement on a piece of heavy cardboard. Spread white glue on the board and reposition the items onto the glue. Allow to dry 24 hours before hanging.

Imaginative Creatures

Again the student should collect natural materials, especially unusual shapes. Have the student examine them and put the pieces together to form a real imaginary creature. Driftwood or rock could serve as a base for the creature while roots and gnarled branches would make interesting bodies. Use an "acorn eye," a "berry nose," etc. Glue will hold the pieces together. Write a poem or story about the creature.

Stone Structures

Collect small stones. With white glue, glue the stones together in abstract or realistic designs. Paint can be used for adding eyes, nose and similar details.



6. SCHOOL SITE DEVELOPMENT

Much information about the environment can be learned from text books, lectures and discussions, but the only way to give truly relevant meaning to these concepts is to go out of doors. In the outdoor classroom children can learn directly *from* the natural environment as well as *about* it. It is not necessary to take lengthy trips by bus to distant locations to accomplish this goal; the best place to start is the school site itself.

There is always a great deal that can be learned on the school grounds, no matter how barren or unexciting a site might appear at first. A dandelion growing from a crack in the sidewalk is a fine example of adaptation and survival. A plant bending around a brick wall to escape the shade will look quite different from its brother growing in full sunlight. Trees and bushes of any type can be used to show similarities and differences in plant and animal habitats. Every school site will contain types of habitats, and through these the basic ideas of ecology can be taught. Many of the problems that we face in the environment today can be seen, in miniature, on most school sites.

The study of the school building itself can illustrate how man has taken natural resources and changed them to fit his needs. The numbers of workers represented by the materials and product can

be a lesson in itself. The school custodian can explain the problems and functioning of the school's facilities.

Some schools are fortunate in having wooded acreage and even streams with which to work, while other schools, usually innercity, have to work with minimal areas and possibly look to vacant lots and small parks for extended study. Still each physical site will offer unique opportunities of discovery and investigation.

After the school grounds have been surveyed and explored as a micro-community and the students begin to see environmental problems on a larger scale, an effort can be made to go on field trips to see larger natural communities.

Dealing with the school and school site also provide opportunities to relate their environmental conditions to the surrounding neighborhood and the community at large—for instance, the relationship of water supply and waste, or the relationship of power generation and supply throughout the community.

PLANNING • RESOURCES • MATERIALS

Each school site presents individual possibilities as well as individual problems. The teacher should first:

1. Survey the grounds to see what resources are available, what environmental problems are present and what modules of conservation and beautification can be constructed. If possible, invite a consultant to help you identify these things. The Department of the Interior and the Department of Agriculture have specially trained experts who will give a school professional advice on planning, landscaping and more complete use of the existing resources. The school custodian or a representative from the Department of Buildings and Grounds can also give you advice. It is desirable that parents be involved as much as possible in both the planning and actual execution of the program.

2. After consultation, prepare a list of realistic goals that can be accomplished within a specific time period. These should include study areas, conservation and beautification plans. Details of these plans should be worked out with the children so that investigations and activities are meaningful and provide interesting personal involvement.

3. Make an inventory of tools and equipment that the school owns; find out what additional resources are available from the Department of Buildings and Grounds. Such things as steel and leaf rakes, shovels, hoes, hand trowels, wheelbarrows, hose, watering cans, and pruning shears are all necessary for planting activities. Determine if funds are available for such things as mulch, topsoil, grass seeds, fertilizer, shrubbery, flower seeds, trees. If not, can these things be obtained from local garden clubs, civic organizations, merchants or the city government? Perhaps a fund-raising activity could be planned by the children to buy these things.

4. Lessons out-of-doors can be a short ten minutes or a series of long-range activities designed to develop a special concept, but they must be planned ahead of time. Practice of certain skills such as recording data or proper use of materials and equipment should first take place in the classroom. Each student should know the purpose of the on-site activity and know his role in it. Whether working individually or in a group, he should have a specific task and, if possible, a simple data sheet to record his information. If these tasks are well-planned and the atmosphere at the site is relaxed and easy-going and if there is adequate follow-up, the experience can be a positive one for all concerned. Most students will be eager to seek similar experiences.

Survey

Children can take an initial survey of grounds as a group. Ask them to observe carefully and make notes on what they think could be studied or problems that could be worked on.

Mapping

Students can later map the school grounds, including landmarks and existing trees, shrubbery, streams, and rock formations. Mapping provides an excellent opportunity to teach or reinforce measurement skills. This activity can be extended to pacing and other arbitrary units of measure, compass and directional games, map collections, contour mapping, cross section mapping and model making. The U.S. Geological Survey will send a map skills teaching kit free of charge upon request.

Tree Identification

Existing trees and shrubs can be identified and labeled. The students can get help from such sources as the school's landscaping plans, tree guide or other reference books, the custodian, parents or a naturalist. Labels should not be nailed into the tree but hung around it on wire or cord.

Adopt-A-Tree

Children can individually "adopt" a tree of their choice on the grounds, or the whole class can adopt a tree to care for. Instruct them to observe it closely,—look at leaves, bark, insect holes, dead branches, new growth. They can keep an on-going record of the seasonal changes in the tree by an observation once a month to record all changes. This record should include measurement of the girth and, if possible, height of the tree; photographs; drawings; leaf prints and bark rubbings. If there's a problem of disease or dead limbs, students could write or call the proper city or school service.

Tree Observations

1. Observe bark layers for texture, thickness and color to see how the outer layer helps protect trees against injuries caused by animals, people and insects.
2. Observe insect holes, tunnels and other signs of damage to lead to a discussion of timber management practices and the economic value of wood products.
3. Look for seedling trees and note under what condition they seem to be thriving.
4. If a stump is available, count the rings in the wood to determine how long the tree grew.
5. Look for exposed tree roots or an uprooted tree. Note the mass of fibrous roots that absorb moisture and minerals from the soil and the heavy roots which anchor the tree to the ground.
6. Many trees have moss or shelf fungi growing on the bark. Investigate what this may mean in the life cycle of the tree.
7. Examine old logs or pieces of wood that are being decomposed by fungi or insects. These organisms are freeing the minerals in the wood, returning them to the soil in the life cycle of the tree.

Survey Plant Variations

A survey can be made of the plant variations on the school grounds by selecting *one* leaf from each kind of vegetation observed. The specimens can be pressed under heavy books for two weeks, then mounted on cardboard and covered with plastic spray or plastic wrap. If students are interested, samples can be identified from nature books.

Evidences of Animal Life and Habitats

Insect life abounds on all school sites. Children can make drawings of as many insects as they can find—a clear plastic pill vial can hold the insect while it is being sketched. Check carefully for signs of burrows and tunnels in hollows, sides of banks, around tree roots, under clumps of vegetation. Make notes on the appearance and location of findings. Droppings are evidence of animal life, as are tracks, feathers, fur or bones.

Insect Collection

Insect collections can be made by:

1. Cutting fly paper into squares and fastening them to leaves, tree trunks and debris to make a sticky trap.
2. Leaving a board on the ground; check under it in a week.
3. Making an insect-killing jar, which is a jar with a tight cover and a small piece of cotton soaked in alcohol or carbon tetrachloride inside. The fumes will suffocate the insect quickly; the insects can then be pinned to a mounting board or to the inside of a cigar box and labeled.
4. Capturing insects with a net made from a coat hanger and nylon stocking.
5. Placing some small insects in a jar to which soil has been added. Small air holes in the cover will keep them alive.

Soil Studies

1. Look for earthworm casts, little piles of earth left on the surface as the earthworm makes its tunnels. Earthworms are valuable soil conditioners: they take plant material down into the earth where it breaks up to help form soil. The tunnels conduct air and moisture to the soil.
2. Look for signs of erosion where water may have washed topsoil from high spots to lower ones; gullies may show where running water carried this soil down the slope. This can become a practical problem-solving conservation project.
3. Dig a hole with a spade to determine the depth of the topsoil. Use a hand lens to note that it is composed of mineral particles mixed with bits of plant and animal remains. Compare the topsoil with the subsoil, which consists largely of mineral particles. Point out that it may take more than three hundred years for an inch of topsoil to form in our climate; then discuss the importance of conservation of soil as a resource.
4. Testing soil to determine pH and nutrient values helps the student understand the importance of soil composition and the need for soil conservation.
5. Lichens on rocks offer an opportunity to study the first stages of soil building. Rock particles can be formed in many ways, but until organic matter is mixed with the rock material, no true soil is formed.

Sundials

Sundials made from a length of old pipe and a half circle of painted concrete help children understand movement of the sun and change of seasons. Observations in the time of day can be marked off with chalk, string or water soluable paint.

CONSERVATION AND BEAUTIFICATION ACTIVITIES

Appreciation

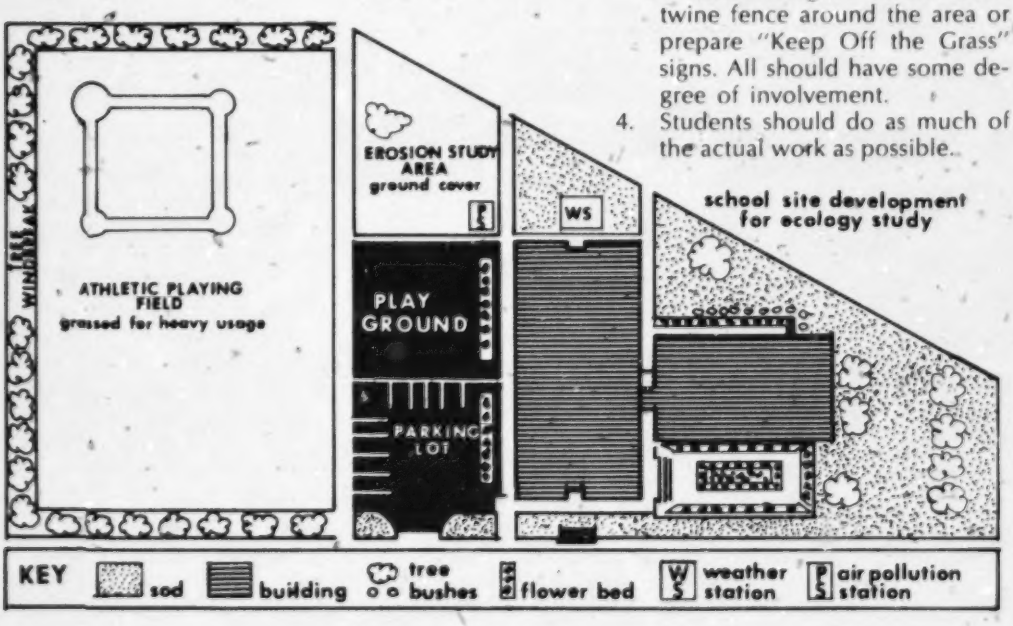
If students work on the landscaping of the school sites, there is a much better chance that the bushes, flowers and trees will not be torn down or destroyed. When a student feels involved in a constructive environmental program, he is less likely to be destructive.

Although the focus for elementary grades is primarily on awareness and appreciation, it is appreciation for the beauty of the site heightened by a knowledge of its parts and delight in new skills developed while working on it.

Planning

Conservation and beautification projects can be as ambitious in scope as developing a nature trail or as simple as planting a flower bed. The key factor in all such projects is planning. Good planning begins with a look at the available resources and the possibilities for developing varied learning situations. Resource specialists can contribute information on soils, suitable plants, indigenous trees and bushes, planting procedures and necessary equipment. Projects should be planned so that failures (to be expected and analyzed) are kept to a minimum. Safety is important. Make sure you are aware of all potentially hazardous areas and provide precautionary measures. The proper handling of tools should also be a learning experience. In any of the following project ideas, it is important that:

1. All tools and equipment be in a central location, labeled, and responsibility delegated for assemblage.
2. The tools and equipment needed for a specific activity are readied ahead of time.
3. Each child know his role in the activity. Thirty-five children cannot dig in one spot at one time. If you are reseeding a lawn, one group could put topsoil into wheelbarrows; one group shovel soil; one scatter grass seed; one rake seed evenly; one scatter mulch; one wet down with hose. Other children might construct a twine fence around the area or prepare "Keep Off the Grass" signs. All should have some degree of involvement.
4. Students should do as much of the actual work as possible.



Projects

1. Grass Seeding—Areas where grass has worn away due to traffic patterns or ball playing can be reseeded, and alternate use of the area can be planned until grass grows.
2. Ground cover, ivy or carpet junipers, can be planted on eroded areas.
3. Trees, shrubs or bushes can be planted in strategic locations on the ground: a windbreak in front of a dusty playing field, a flowering dogwood in the center of a courtyard, evergreens as a border of a driveway or a large deciduous shade tree in front of a sunny window.
4. Flowers can be planted in almost any conceivable spot. Experiment with patterns such as circles or rectangles. Plan ahead for springtime by planting tulip, daffodil and crocus bulbs in the fall. Flowers can be planted from seed directly into the ground, or they can be started in flats in the classroom and transferred outside at the appropriate time. If planting in a semi-shaded area, be sure you choose an appropriate plant.
5. If outdoor space is a problem, build simple flower boxes to put in the windows of the classroom or school—perhaps the custodian or a parent could help with their placement.
6. A portion of the school grounds might be allotted to mini-gardens. Mini-gardens can contain vegetables, flowers, combinations of both or even a vegetation study area depicting a forested region, grasslands, desert or cropland. Keep in mind that this can be accomplished in a minimal area as small as 200 square feet. These mini-gardens can also be started in very early spring in the classroom. Any type of containers can be used—bushel baskets, pails, buckets, cardboard boxes lined with plastic, planters of any type. Be sure the containers have drainage holes and are not overwatered. Classroom mini-gardens have the advantage of being mobile to follow the sun. Railroad ties piled into box form, filled with soil, mulched, and trees, shrubbery or flowers can brighten urban school blacktop areas.
7. The upkeep of planted areas on the grounds can be undertaken by weeding and mulching under trees and bushes. Wounds in trees may be treated with creosote to prevent insect damage.
8. Chalk marks and grafitti on the outside of buildings are an increasing problem. A wash-up, paint-up, sweep-up project with sponges, brushes and paint might help. There are commercial "grafitti-remover" cleaners on the market as well.

Reminders:

Whatever projects are undertaken, be sure that a photo record is kept of "before," "during" and "after" activities. If slides are used, they could be the focal point for a school assembly to motivate participation on a school-wide basis.

VACANT LOTS • VEST POCKET PARKS • URBAN TRAILS

If the school site is inadequate for your plans, look for a vacant lot in the vicinity. If using a vacant lot or private property, permission must be secured from the owner. Arrangements should be made for insurance or statements of liability by the school stating that the study area would be treated as any school area and that the owner in no way be liable for accidents. It should also be noted that the children would not use the area except under supervision and that nothing would be cut or destroyed. The owner should be thoroughly apprised of the types of activities to be undertaken.

The entire process of obtaining permission, setting up ground rules and, of course, thanking the owner, should be the responsibility of the students.

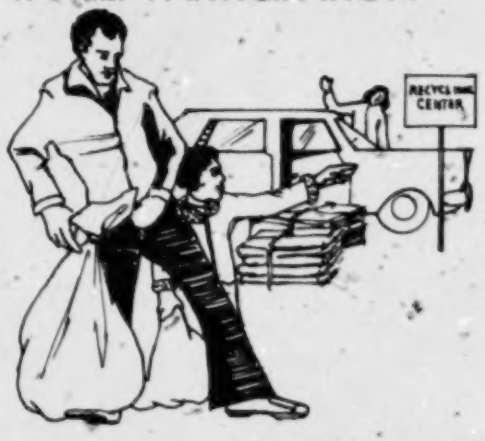
In an urban area where parks are often at a minimum, the possibility of de-

veloping a vest-pocket park might be explored. City, state and federal funds are often available for communities that want to establish small neighborhood parks. If land is available and the need for such a park exists, it might be possible for the students to conduct a campaign to gain support for the idea. The curriculum possibilities are endless in such an activity:

- *in language arts* letters to the mayor and other elected officials suggesting such a park, making a proposal, planning the park, talking to people in the community.
- *in mathematics* determining the size of the area, making cost estimates, mapping.
- *in science* what plants and trees are already there? What other planting would be compatible?
- *in social studies* how would the park benefit the community? How do people feel about a park? What problems might there be? How could they be overcome?

Another project for city schools could be to construct a planned walk in man-made surroundings. Just like a nature trail, a city block is composed of air, earth, water and populations. You can see varieties of these elements in any man-made setting. Instead of plants and trees, one observes houses, telephone poles, signs. Instead of animals and insects, one observes people and their habits. Instead of noticing how the natural elements interact to bring growth and change in a nature trail, one considers how the patterns of electric lines, sewage units and general city planning ensure man's adaptation to his environment. Local representatives of the Department of Housing and Urban Development and local city planners can provide valuable assistance in creating your urban environmental trail. Children can analyze the needs of people living in the city and determine how and if these needs are met.

7. FAMILY PARTICIPATION

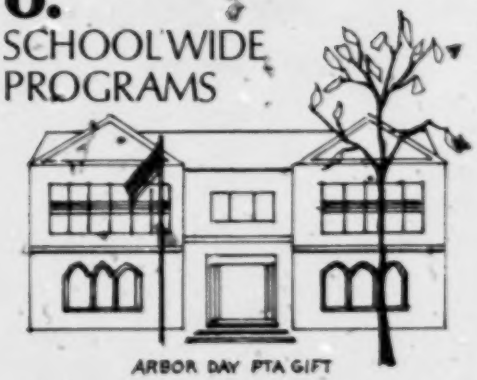


Parents should be involved in your environmental learning program whenever possible. A periodic newsletter for parents could be a class language arts activity. The children could summarize completed activities, discuss on-going projects and outline future plans. They could inform their parents about environmental concerns and also point up ways in which parents might help. A newsletter is also a good way to solicit tools and materials, as well as suggestions, advice and goodwill.

Involving the family unit in improving the quality of the environment should not prove difficult and can be as simple as saving bottles, cans and newspapers for recycling, or as dramatic as agreement on reducing air pollution by not using the family car except for essential trips. Perhaps everyone could agree to try a fly swatter to kill insects instead of a spray can of insecticide, and a concerted family effort to conserve energy can effectively cut utility bills.

While all such family activities are commendable in that they attack the existing problems, perhaps their greatest contribution is that they help form sound conservation attitudes. If parents show a concern for the kind of world their children will inherit, it is likely that the children themselves will adopt the same positive values.

8. SCHOOLWIDE PROGRAMS



ARBOR DAY PTA GIFT

You will probably find that your environmental learning program will have far reaching effects within the school. The very nature of the activities that it engenders will soon have other classes and teachers asking questions of how they, too, can get involved. The Johnny Horizon Classroom Kit contains a letter outlining organizational steps for a school-wide environmental program as well as many other helpful ideas. It is available upon request to all teachers. Write—Johnny Horizon Program, U.S. Department of the Interior, Washington, D.C. 20240.

Any environmental learning program or cleanup campaign will have a greater degree of success if the entire school community, including the PTA, participates. Everyone can take part in observing national conservation or ecology days, such as the Johnny Horizon '76 Environmental Month (September 15 to October 15), National Wildlife Week, or Arbor Day, to mention a few. The planting of trees on Arbor Day could be an event where parents and friends are invited to participate. Organizations such as the State Forest Service, or local garden clubs will sometimes supply free trees or seedlings.

ECOLOGY CLUBS

A club is an alternative means of working with students who are interested in environmental learning. Such clubs fit in well with individualized instruction modules by offering a variety of activities to meet the needs of a number of students and by providing opportunities for many students to learn leadership skills. Meetings can be held after school as an extra-curricula activity or as an extension of the science program. Members should select a suitable name—the PYE's (Protect Your Environment), Ecoclub, the Johnny Horizon Club, the I Care Club, etc. Badges, decals, hats or T-shirts displaying the club's name or symbol would strengthen this identification.

You will also need to establish an effective means of communication to keep the members informed of meetings and "happenings."

Most of the activities in this booklet are applicable to ecology clubs, but the students will soon initiate projects on their own.

FUND RAISING

The time will come when you will find that materials are not available for some of your projects. You and the students might want to purchase a supply of bird feed and lumber to make feeders, shrubbery for a beautification project or additional environmental education materials for the school. Appropriate fund-raising activities could be:

- a candy or bake sale
- a car wash for faculty and/or community
- making jewelry from natural objects and selling it
- a community yard clean-up service
- collecting large-mouth, gallon jars from restaurants and making and selling terrariums
- a recycling campaign
- a music festival of amateur or professional entertainers
- a school yard fair or carnival
- selling flower seedlings that have been started in the classroom
- at Christmas, making and selling simple wreaths
- at Easter, selling daffodils or plants started by the students.

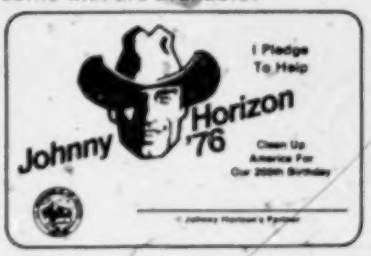
Johnny Horizon '76

Let's Clean Up America For Our 200th Birthday

9. AWARDS AND RECOGNITION

A measure of the success of an environmental learning program will be the amount of effort and enthusiasm shown by the students. To keep the interest high, there should be as much recognition of achievement as possible.

- Display of projects and activities should be visible at all times in the classroom, ecology center or the hall bulletin boards.
- If your school has a newspaper, all activities should be reported.
- Local newspapers can be called to inform them of the program. They may want to give coverage to some of the larger activities.
- Write to the Johnny Horizon Program to let them know what you are doing. The information can be published in the Program's News-Gram.
- Let local civic and garden associations know so they can give recognition to the children's efforts.
- Enter the President's Environmental Award Contest sponsored by the Environmental Protection Agency, Washington, D.C.
- If your city government sponsors an environmental awards contest, enter your projects.
- Be sure to include environmental achievement awards in your school's Awards Day ceremony. The Johnny Horizon Program will be glad to send you the appropriate certificates. These are some that are available:



National Award—Given to an organization or individual for an event of national significance. Usually awarded but once a year and presented by the Secretary of the Interior.

Environmental Award—Awarded to groups, individuals or industries who have completed outstanding projects involving an entire region or state.

Sponsor Certificate—For organizations that endorse the objectives of the Program, use Johnny Horizon materials, and develop or conduct one or more environmental/ecological program.

Certificate of Appreciation—Awarded to individuals, groups and organizations for service to the community in carrying out a cleanup, beautification or anti-pollution education program.

Classroom Participation Certificate—For classroom use; space provided for listing each student's name.

Partner Certificate—Awarded to individuals who have pledged to support the Johnny Horizon program by word or deed. Especially appropriate for children.

Shoulder Patch— Presented to youth or adult groups or to individuals for local projects. May also be presented to individual members of a group receiving Johnny Horizon awards. Patches available in limited quantities only. A local program sponsor may purchase large quantities directly from manufacturer.

10. ENVIRONMENTAL ORGANIZATIONS, MATERIALS AND SOURCES

Many helpful pamphlets and booklets can be obtained from these sources:

AIR

Air Pollution Control Association
4400 5th Avenue
Pittsburgh, PA 15213

Citizens for Clean Air
40 W. 57th Street
New York, New York 10019

BEAUTIFICATION

Garden Club of America
598 Madison Avenue
New York, New York 10022

FOREST AND CONSERVATION

The Wilderness Society
729 15th Street, N.W.
Washington, D.C. 20005

NOISE

Citizens for a Quieter City
150 Amsterdam Avenue, N.
New York, New York 10023

POPULATION

Zero Population Growth
367 State Street
Los Altos, California 94022

WATER

Water Pollution Control Federation
3900 Wisconsin Avenue, N.W.
Washington, D.C. 20005

Water Resources Council
2120 L Street, N.W.
Washington, D.C. 20037

WILDLIFE AND ANIMALS

National Wildlife Federation
1412 16th Street, N.W.
Washington, D.C. 20036

Sport Fishing Institute
608 13th Street, N.W.
Washington, D.C. 20005

National Audubon Society
950 3rd Avenue
New York, New York 10022

Izaak Walton League of America
1800 North Kent Street
Arlington, Virginia 22209

GENERAL ENVIRONMENTAL PROTECTION AND INFORMATION

National Center for Resource Recovery, Inc.
1211 Connecticut Avenue, N.W.
Washington, D.C. 20036

The Sierra Club
220 Bush Street
San Francisco, California 94104

Friends of the Earth
30 East 42nd Street
New York, New York 10017

Environmental Action Committee
2000 P Street, N.W., Rm. 200
Washington, D.C. 20036

GOVERNMENT AGENCIES

These agencies disseminate information films and materials for school or club use. Write for particular requests or general information.

Johnny Horizon '76 Program
U.S. Department of the Interior
Washington, D.C. 20240

Soil Conservation Service
U.S. Department of Agriculture
Washington, D.C. 20242

Environmental Protection Agency
Waterside Mall
401 M Street, S.W.
Washington, D.C. 20460

National Industrial Pollution Control Council
U.S. Department of Commerce
14th Street & Constitution Ave., N.W.
Washington, D.C. 20230

National Park Service
U.S. Department of the Interior
Washington, D.C. 20240

Office of Environmental Education and Interpretation
Fish and Wildlife Service
U.S. Department of the Interior
Washington, D.C. 20240

Bureau of Land Management
U.S. Department of the Interior
Washington, D.C. 20240

Bureau of Outdoor Recreation
U.S. Department of the Interior
Washington, D.C. 20240

TRADE ASSOCIATIONS AND INDUSTRIES

Materials are available on individual company's involvement in environmental protection and on specific problem areas.

The Aluminum Association
750 Third Avenue
New York, New York 10017

American Iron and Steel Institute
150 East 42nd Street
New York, New York 10017

American Petroleum Institute
1801 K Street, N.W.
Washington, D.C. 20036

American Forest Industries
1619 Massachusetts Avenue, N.W.
Washington, D.C. 20036

American Paper Institute
260 Madison Avenue
New York, New York 10016

Glass Container Manufacturers Institute
330 Madison Avenue
New York, New York 10017

National Solid Waste Management Assoc.
1145 19th Street, N.W.
Washington, D.C. 20030

Society of the Plastics Industry
250 Park Avenue
New York, New York 10017

PUBLICATIONS

You can write to the magazines and newsletters for sample copies or subscription rate information. Your public library will have some of these and other periodicals.

Audubon Magazine
National Audubon Society
950 Third Avenue
New York, New York 10022

Eco-News
235 East 49th Street
New York, New York 10017

Environmental Action
1346 Connecticut Avenue, N.W.
Room 731
Washington, D.C. 20036

Catalyst for Environmental Quality
274 Madison Avenue
New York, New York 10016

National Park and Conservation Magazine
1701 18th Street, N.W.
Washington, D.C. 20009

Conservation News
National Wildlife Federation
1412 16th Street N.W.
Washington, D.C. 20036

Environment
Scientists Institute for Public Information
P.O. Box 755
Bridgeton, Missouri 63044

Environmental Education Report
1621 Connecticut Ave. N.W.
Washington, D.C. 20009

11.
SUGGESTED READING

Do not spend a lot of time gathering tons of material. Start with a few good things, and let your own needs determine where you go from there. Excellent curriculum guides are available from many sources—some of them free upon request. Inquire at the curriculum department of your State board of education.

A complete listing is impossible, but here are some publications that may prove helpful.

All Around You Teacher's guide with student text pages. Grades 3-8. Single copies free. (Bureau of Land Management, U.S. Department of the Interior, Washington, D.C. 20240)

Kingsport Project Community-based environmental studies. (Jack Rhoton, Coordinator, Environmental Education, Kingsport City Schools, Kingsport, Tennessee 37664)

Using the School and Community as Environmental Study Areas Teacher's guide and student activities, Grades K-6. Nashville Metro Schools, Environmental Education Department, Nashville, Tennessee 37202.

Essence Teacher's guide, K-6. Values oriented idea and activity cards, $10.00 per set. (American Geological Institute, 2201 M Street, N.W., Washington, D.C. 20037)

Examining Your Environment Series—*Pollution, Mini-Climates, Ecology, Trees, Birds, Running Water,* Wentworth, D. F., Couchman, J. K. A series of paperback texts covering many aspects of the environment in depth. Grades 4-6. $3.25 each. (Mine Publications, Inc.; 25 Groveland Terrace, Minneapolis, Minnesota 55403)

Series of Environmental Units—*Vacant Lot Studies, Man's Habitat—The City, Nature Hunt, Nature's Art, Habitat Study, Plant Puzzles.* Minnesota Environmental Education Series. Environmental activity ideas for teacher and student. Grades 3-6. Paperback book. $1.50 each. (National Wildlife Federation, 1412 16th Street, N.W., Washington, D.C. 20036)

☆ U.S. GOVERNMENT PRINTING OFFICE : 1974 O – 558–718

For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402
Price $1.25 Stock Number 2400–00805

12. AUDIO-VISUAL AIDS

Make use of the audio-visual materials that are available in your school system. If you need additional materials, here are some suggested films that should prove helpful.

Your Environment Is The Earth–13 minutes. Shows ecology as the relationship of living things to one another and their environment by examining the desert, prairie, tundra and rain forest. (Journal Films, 909 West Diversey Parkway, Chicago, Illinois 60614)

Conservation: A Job For Young America–19 minutes. An action-oriented film that offers proposals for getting students involved in environmental cleanup and conservation. It shows a group of children planting trees, collecting litter, building birdhouses and cleaning a stream. (Contemporary-McGraw Hill Films, 1221 Avenue of the Americas, New York, New York 10020)

Conservation: For The First Time–9 minutes. Made by children, this film shows a great sensitivity to the environment and the necessity of conservation by all people. (Contemporary-McGraw Hill Films, 1221 Avenue of the Americas, New York, New York 10020)

From Start to Finish–10 minutes. Tells the story of a girl's visit to a nature center. She narrates about the animals and their part in nature's recycling system. Words of the narrator are superimposed on the screen for reading practice. (ACI Films, Inc., 35 West 45th Street, New York, New York 10024)

Steel—The Recycled Material–10 minutes. Illustrates the importance of solid waste recycling. Reports on what the steel industry and many communities are doing now to reclaim, recycle and reuse steel. (Association-Sterling Films, 866 Third Avenue, New York, New York 10022)

Ecology At Work: A Study of the Sea Otter Three 15-minute filmstrips. Study of otter's habitat, life cycle and behavior adaptations. (Custom Service Department, Schloat Productions, 150 White Plains Road, Tarrytown, New York 10591)

Sod Busters–29 minutes. Explores the pioneer ethic that Americans have a right to grow, expand and profit. (Audio-Visual Center, Indiana University, Bloomington, Indiana 47401)

The Redwood Trees–15 minutes. Gives the history, ecology and socio-economic importance of redwood trees and the importance of preserving natural resources. (Arthur Burr Productions, Inc., P.O. Box 7-C, Pasadena, California 91104)

City Life–29 minutes. Urban specialist Lewis Mumford expounds the view that people living in a city must get involved so that the city's social environment will reflect their needs. (Audio-Visual Center, Indiana University, Bloomington, Indiana 47401)

Energy and Matter–9 minutes. Introduces a few important energy concepts, including: the sun as a source of all energy; the ability of energy to change forms; the fact that energy and matter are essentially one and the same. (Contemporary-McGraw Hill Films, 1221 Avenue of the Americas, New York, New York 10020)

Life In A Vacant Lot-10 minutes. The setting is an urban vacant lot which houses complex food chains between two towering apartment buildings. One day, bulldozers come to the lot to begin construction of another building. (Encyclopedia Britannica Education Corp., 425 North Michigan Avenue, Chicago, Illinois 60611)

Turn Off Pollution-11 minutes. Children identify pollution as a problem in need of a solution. They make posters and write letters to Congressmen. (Encyclopedia Britannica Education Corp., 425 North Michigan Avenue, Chicago, Illinois 60611)

Environmental Enrichment—What You Can Do About It-21 minutes. Tells the story of an elementary class which decides to get "involved" in the environment. They form committees, gather information and raise funds to alter their schoolgrounds. (Central Educational Films, 1821 West 9th Street, Lawrence, Kansas 66044)

Our Vanishing Wilderness Eight 30-minute films that illustrate how man has damaged various aspects of his environment. Titles are *Will the Gator Glades Survive?, The Prairie Killers, Santa Barbara—Everybody's Mistake, The Chains of Life, Of Broccoli and Pelicans and Celery and Seals, Slow Death of Desert Water, The Water Is So Clear That A Blind Man Could See* and *The Prudhoe Bay—Or Bust.* (Audio-Visual Center, Indiana University, Bloomington, Indiana 47401)

Cycles-13½ minutes. Deals with the importance and methods of recycling. (Association-Sterling Films, 866 Third Avenue, New York, New York 10022)

Lassie's Litterbit-25 minutes. Deals with the need to respect and maintain our natural resources. Featuring beloved dog star Lassie. (Modern Talking Picture Service, 2000 L Street, N.W., Washington, D.C. 20036)

All The Difference-20 minutes. Points up the condition of the land and other elements of our environment by comparing their good use to the bad. (Modern Talking Picture Service, 2000 L Street, N.W., Washington, D.C. 20036)

The U.S. Department of the Interior has many films available on such subjects as the earth sciences, wildlife resources, mineral resources, States and their natural resources, outdoor recreation, parks and related activities. For a brochure listing these films write:

Visitor Information Center
U.S. Department of the Interior
Washington, D.C. 20240